

REMARKS

In the outstanding Office Action, the Examiner rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over United States Patent Application Publication US 2004/0106292 to Sato et al. ("Sato") in view of Applicants' Admitted Prior Art ("AAPA"); and rejected claims 2-4 under 35 U.S.C. § 103(a) as being unpatentable over Sato in view of AAPA, and further in view of U.S. Patent No. 6,596,607 to Ahn ("Ahn").

By this amendment, Applicants amend claim 1, and add new claim 5. Claims 1-5 are pending.

Rejection under 35 U.S.C. § 103(a)

Regarding the rejection of claims 1-4 under 35 U.S.C. § 103(a), Applicants respectfully disagree with the Examiner's arguments and conclusions as set forth in the Office Action. Accordingly, Applicants respectfully traverse this rejection.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103(a), each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element recited in the claims. (See M.P.E.P. § 2143.03 (8th ed., 2001)). Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of the three requirements must "be found in the prior art, and not be based on applicant's disclosure." (M.P.E.P. § 2143 (8th ed., 2001)).

Claim 1

Claim 1, as amended, recites a combination including, *inter alia*, “then subjecting said coat to chemical reaction to form a film of silicon oxide” and “heating said silicon oxide left in said device isolation trench to remove impurities for densification.” Sato fails to teach at least these elements.

Applicants initially note that the descriptions in paragraphs [0055]-[0056] in Sato include technical mistakes or misunderstandings. Specifically, paragraph [0055], line 12-18, states: “the coating film 6c, such as an inorganic spin-on glass (SOG) film of polysilazane,” while, in the same paragraph, lines 18-22, Sato states: “the coating film 6c is made of silicon oxide, for example.” Sato further states: “[the coating film] is fluid with not more than 100mPa viscosity coefficient at a temperature of 25 [degrees] C.” These descriptions are in contradiction, and are therefore, not completely understood. Polysilazane $[\text{SiH}_2\text{NH}]_n$ is a different material than silicon oxide SiO_2 . Polysilazane does not contain oxygen atoms, whereas silicon oxide does. Additionally, silicon oxide SiO_2 is solid and does not have a viscosity such as “100mPa viscosity coefficient at a temperature of 25 [degrees] C.” Thus, one of ordinary skill in the art would understand the description in paragraph [0055], lines 18-19, describing the coating as silicon oxide, to be a mistake, and would therefore understand coating film 6c to be a polysilazane film, not a silicon oxide film.

Additionally, at paragraph [0056], lines 8-12, it is described that a coating film 6c is put under the thermal process in a nitrogen atmosphere to improve the quality of the film. The Examiner asserts that this description coincides with “heating said silicon oxide left in said device isolation trench for densification,” as recited in claim 1. Office Action, page 3. Contrary to the Examiner’s assertion, as described above, one of

ordinary skill in the art would understand the description “the coating film 6c is made of silicon oxide” in Sato to be a mistake, and would recognize coating film 6c as a polysilazane coating film. Therefore, Sato does not disclose at least the element of “heating said silicon oxide left in said device isolation trench to remove impurities for densification,” as recited in amended claim 1.

Since the coating film 6c is a polysilazane with no oxygen atoms, heating the film 6c in a nitrogen atmosphere (as described in paragraph [0056], lines 8-12) does not produce any silicon oxide films. Therefore, Sato does not disclose at least the elements “then subjecting said coat to chemical reaction to form a film of silicon oxide” and “heating said silicon oxide left in said device isolation trench to remove impurities for densification.” Thus Sato fails to teach or suggest each and every limitation of claim 1.

AAPA is cited to cure these deficiencies. Applicants submit, however, that there is no motivation for combining the references in the manner that the Examiner is suggesting, as AAPA teaches away from the claimed invention. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

In Applicants’ claim 1, the step of “heating said silicon oxide left in said device isolation trench to remove impurities for densification” is conducted after “removing said film of the silicon oxide leaving a residue inside said device isolation trench.” In contrast, in AAPA these two steps are conducted in a reversed order. That is, in AAPA, “heating said silicon oxide for densification” is conducted first, and thereafter “removing said film of the silicon oxide leaving a residue inside said device isolation trench” is performed using a CMP method. Applicants’ specification, pages 1-3, and Figure 15.

Using the order of steps in AAPA, shape deterioration in device isolation trenches is *inevitable*. Conversely, with the above-described arrangement of Applicants' claim 1, silicon oxide, excellent in etching resistance, can be buried without shape deterioration even in a narrow device isolation trench (see Applicants' specification at, for example, pages 3-4).

Applicants therefore submit that the cited references fail to teach each and every element of claim 1. Moreover, one of ordinary skill in the art would not have looked to AAPA to modify the method of Sato, as it would have an undesirable effect, i.e., producing a semiconductor device with an inevitable shape deterioration in isolation trenches. Thus, there is at least a lack of motivation for combining the references in the manner the Examiner has suggested. Accordingly, a *prima facie* case of obviousness has not been made. Applicants therefore respectfully request that the rejection of claim 1 under 35 U.S.C. § 103(a) be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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